Student Name _____

Teacher Name _____
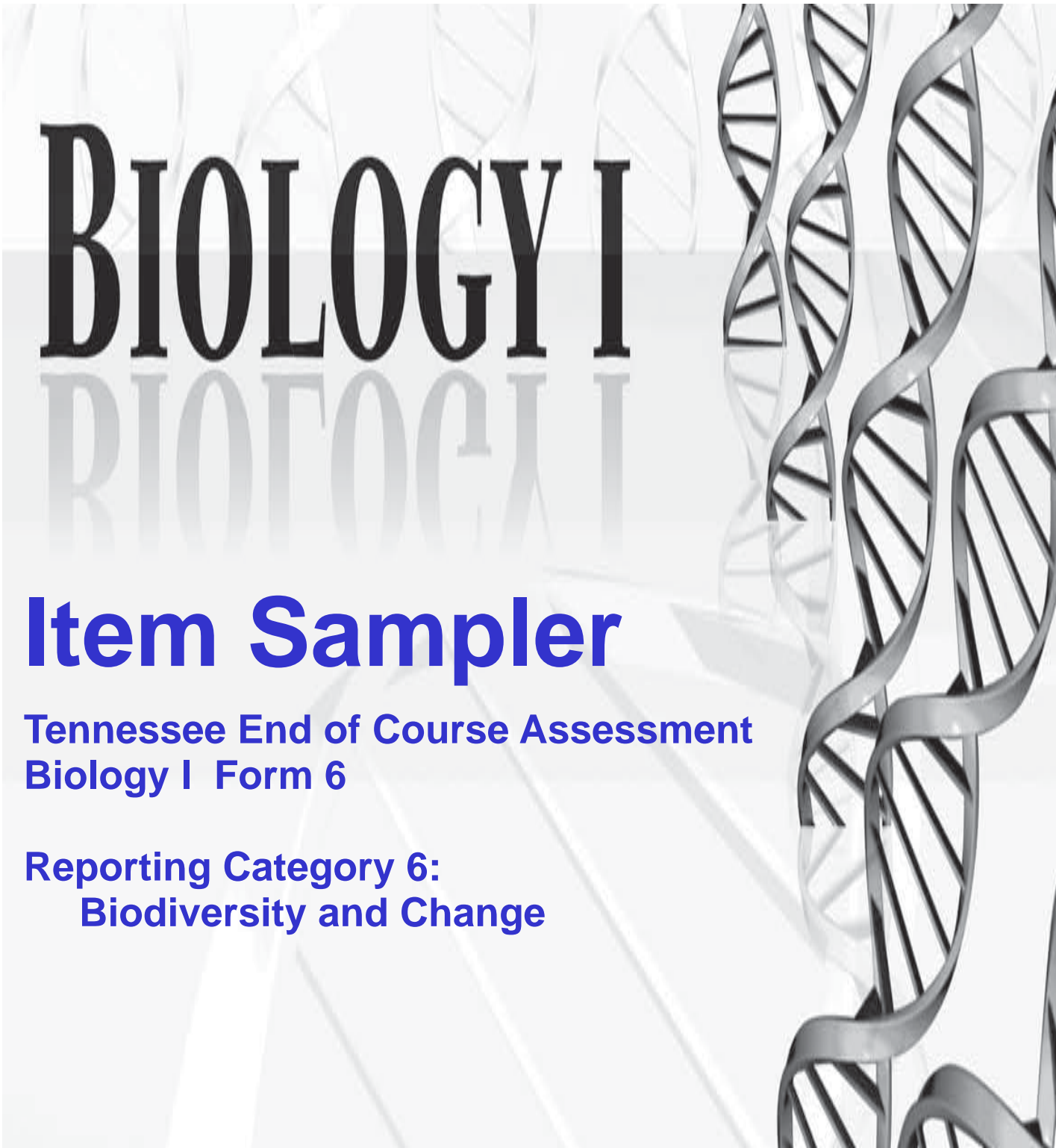
School _____

System _____

BIOLOGY I

Item Sampler

Tennessee End of Course Assessment
Biology I Form 6

Reporting Category 6:
   Biodiversity and Change

PEARSON

Contents

Introduction to Biology I

Content of tests

The testing program titled the *Tennessee End of Course Assessment* was established to meet the Tennessee mandate for end of course assessments in Tennessee secondary schools. These tests measure the Tennessee State Performance Indicators. Subject areas covered by the end of course assessments include Mathematics, Language Arts, History, and Science.

Test development

For the *Tennessee End of Course Assessment,* a staff of writers – composed of both teachers and professional test developers experienced in each of the content areas – researched and wrote the items. Professional editors and content specialists carefully reviewed all items and test directions for content and accuracy. To provide a large pool of items for final test selection, the test developers created approximately twice as many items as were needed in the final editions of the tests.

After tryout tests were administered, student responses were analyzed. Professional content editors and researchers carefully reviewed items, their data, and test directions for content, suitability, and accuracy before including particular items and test directions in operational tests.

Test administration

Tennessee End of Course Assessments are given to students as they near the end of courses that are included in the program. Tests may be given midyear for block schedules or near the end of the school year.

You will have ample time to read and answer each of the questions. The Biology I test has been designed to be administered in one session and is not timed.

Tips for Taking the Test

Preparing for the test

- Review this Tennessee End of Course Item Sampler for Biology I carefully and thoroughly.
- Acquire the Tennessee End of Course Practice Test for Biology I, and take the test several times.
- Become familiar with the correct way to mark answers on the answer sheet.

Before the test

- Get a good night's sleep. To do your best, you need to be rested.

During the test

- Relax. It is normal to be somewhat nervous before the test. Try to relax and not worry.
- Listen. Listen to and read the test directions carefully. Ask for an explanation of the directions if you do not understand them.
- Plan your time. Do not spend too much time on any one question. If a question seems to take too long, skip it and return to it later. First answer all questions that you are sure about.
- Think. If you are not sure how to answer a question, read it again and try your best to answer the question. Rule out answer choices that you know are incorrect and choose from those that remain.

Directions for Using the Item Sampler

This Item Sampler for Biology I provides specific information to students and teachers. It contains examples of different item types for each Performance Indicator that may be tested in any given end of course test administration. Performance Indicators have been grouped by Reporting Categories. These Reporting Categories will be used to report information regarding performance on the end of courts test to students, teachers, schools, and systems.

The items in this Item Sampler will not be found in the end of course tests. The number of items in this Item Sampler does not reflect the emphasis of content on the test. In order to identify the emphasis of content, the End of Course Assessment Practice Test for Biology I should be used. The Practice Test gives a better representation of content emphasis across Reporting Categories and Performance Indicators.

An Answer Key is located in Page 29. Use it to check your answers. Review items that you get wrong.

Reporting Category: **Biodiversity and Change**

Numbers 1 through 44

Performance Indicator: 3210.5.1 Compare and contrast the structural, functional, and behavioral adaptations of animals or plants found in different environments.

1.

The natural habitat of moose is moist forests or swampy areas. Elephants inhabit the African savannas and India. Both of these species take mud baths, or roll in mud, until their bodies are covered with a coating of mud. Why do animals from such different environments display the behavior of rolling in mud?

- A Mud has a cooling effect on the animals and protects them from insects.
- B Mud contains valuable nutrients that the animals absorb through their skin.
- C Covering themselves in mud is used as a method of camouflage from predators.
- D The drawing action of mud as it dries helps the animals remove excess body fluid.

Performance Indicator: 3210.5.1 Compare and contrast the structural, functional, and behavioral adaptations of animals or plants found in different environments.

2.

Oak trees are native to temperate climates and have leaves. Cacti are native to desert climates and have modified leaves called spines.

Cactus Spines   Oak Tree Leaf

How are the spines on a cactus different from the leaves on an oak tree?

- A They reduce water loss.
- B They reduce oxygen release.
- C They provide heat exchange.
- D They provide nutrient intake.

Go On ▶

Performance Indicator: 3210.5.1 Compare and contrast the structural, functional, and behavioral adaptations of animals or plants found in different environments.

3. Some brightly colored rain forest frogs are very poisonous. Their toxins can be so deadly that an amount equal to three grains of salt can kill a 150-pound human. Desert cacti have spines instead of leaves. One species has sharp spines three times longer than the body of the cacti. These structural adaptations <u>most</u> likely help rain forest frogs and desert cacti to survive by aiding in which life function?

  A reproduction

  B catching prey

  C conserving energy

  D avoiding predators

Performance Indicator: 3210.5.1 Compare and contrast the structural, functional, and behavioral adaptations of animals or plants found in different environments.

4. Many aquatic plants lack woody tissue. Many terrestrial plants are woody. Why do many aquatic plants lack woody tissue?

  A Water provides support from buoyancy for aquatic plants.

  B Water reduces the gravity aquatic plants experience.

  C Aquatic plants must bend due to water currents.

  D Aquatic plants do not have a root system.

Go On ▶

Performance Indicator: 3210.5.1 Compare and contrast the structural, functional, and behavioral adaptations of animals or plants found in different environments.
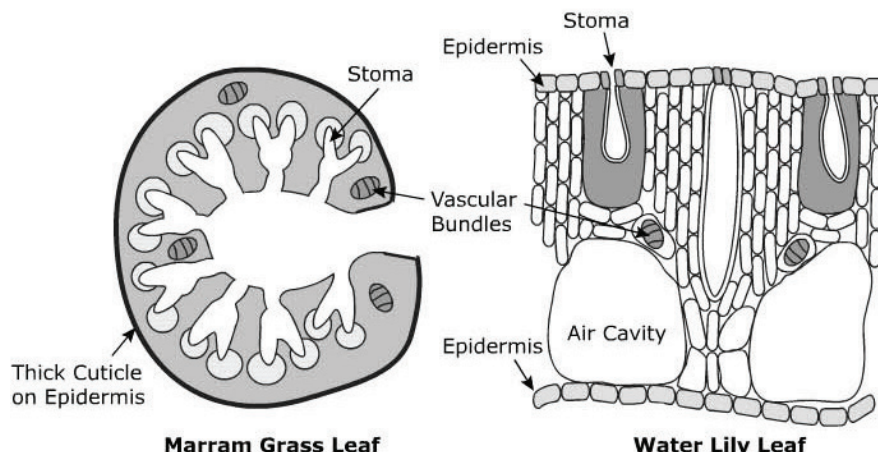
5.

Marram grasses grow on dry sand dunes. They have small leaves that roll inward to form a circle. Water lilies grow on the surface water of ponds and lakes. The water lilies have large, flat, broad leaves that float on the water's surface.

Marram Grass Leaf   **Water Lily Leaf**

From studying the diagrams, which conclusion can be drawn about the adaptations of leaves to different environments?

○ **A** Leaves in wet habitats have a thicker epidermis covered with a waxy cuticle.

○ **B** Leaves in dry habitats have sunken stomata to reduce rate of evaporation.

○ **C** Leaves in dry habitats have large air spaces and small vascular bundles.

○ **D** Leaves in wet habitats have all the stomata on the lower surface.

Performance Indicator: 3210.5.2 Recognize the relationship between form and function in living things.

6.

Penguins live in the Antarctic. They have small wings, webbed feet, streamlined bodies, mostly white feathers on their stomachs, and black feathers on their backs for heat absorption. Penguins cannot fly but are excellent swimmers. They are able to swim up to 15 mph underwater.

Which characteristics play the greatest role in the penguin's ability to be an excellent swimmer?

○ **A** flipper-like wings and webbed feet

○ **B** thick layer of skin and webbed feet

○ **C** thick layer of skin and dark feathers

○ **D** dark feathers and a thick layer of blubber

Go On ▶

Performance Indicator: 3210.5.2 Recognize the relationship between form and function in living things.

7.

Plants are some of the most diverse species on Earth and have evolved methods of ensuring reproduction. Several reproductive adaptations in flowering plants are the colors, odors, and shapes of the flowers. Which statement <u>best</u> describes why variation in flower characteristics improves the chances of plant reproduction?

○ **A** Different flower characteristics increase competition of pollination with other plant species.

○ **B** Different flower characteristics reduce the risk of cross pollination with other plant species.

○ **C** Different flower characteristics reduce the chance of pollination by disease-carrying organisms.

○ **D** Different flower characteristics increase the chance of pollination by different means in the environment.

Performance Indicator: 3210.5.3 Recognize the relationships among environmental change, genetic variation, natural selection, and the emergence of a new species.

8.

A species of snail displays differences in shell stripe patterns as shown in the diagram below.

What concept is <u>best</u> illustrated by these shell stripe patterns?

○ **A** genetic variation

○ **B** population isolation

○ **C** reproductive success

○ **D** environmental pressure

Performance Indicator: 3210.5.3 Recognize the relationships among environmental change, genetic variation, natural selection, and the emergence of a new species.

9.

When newly formed islands are initially populated, several species may evolve from a common ancestor through the process of adaptive radiation. Why are newly formed islands able to support a variety of species?

○ **A** There are likely many niches to occupy.

○ **B** There are likely many natural resources.

○ **C** There are likely limited chances for competition.

○ **D** There are likely limited numbers of predators.

Performance Indicator: 3210.5.3 Recognize the relationships among environmental change, genetic variation, natural selection, and the emergence of a new species.

10.

Many different factors influence the rate of evolution. The table lists several factors affecting four populations.

Population	Population Size	Environment	Mutation Rate	Reproductive Rate
1	Large	Changing	Low	Fast
2	Large	Stable	High	Slow
3	Small	Changing	High	Fast
4	Small	Stable	Low	Slow

Which population most likely experiences the fastest rate of evolution?

○ **A** Population 1

○ **B** Population 2

○ **C** Population 3

○ **D** Population 4

Go On ▶

Performance Indicator: 3210.5.3 Recognize the relationships among environmental change, genetic variation, natural selection, and the emergence of a new species.

11.

Scientists took 200 flies of the same species and put 50 flies in four different containers. Two of the containers included glucose as food, and two included maltose as food. After 50 generations, the flies eating glucose would only breed with flies that ate glucose, and the flies eating maltose would only breed with flies that ate maltose. The results of this experiment are an example of what type of occurrence?

- **A** mutation
- **B** speciation
- **C** natural selection
- **D** selective breeding

Performance Indicator: 3210.5.4 Describe the relationship between the amount of biodiversity and the ability of a population to adapt to a changing environment.

12.

A change in the pH of water in a lake reduces the fish species population native to the lake. How would the change in fish population <u>most</u> likely affect the ability of the lake system to survive further changes?

- **A** The lake could become vulnerable to invasive fish species that could cause breeding between species and change the cycling of nutrients.
- **B** There could be a change in nutrient and energy cycling, threatening ecosystem health due to loss of biodiversity.
- **C** There could be a stress-induced increase in the mutation rate of the fish, causing a change in species interactions.
- **D** The stability of the lake's food web could be threatened because the fish drop one trophic level.

Go On ▶

Performance Indicator: 3210.5.4 Describe the relationship between the amount of biodiversity and the ability of a population to adapt to a changing environment.

13.

Numbats are small endangered animals that live in Australia. They are dependent on termite-infested, old, rotting trees for shelter. Termites and ants are the numbats' only food source. If the old-growth forest trees were lost because of development, what would happen to the numbats?

- **A** They would change both food and nesting habits.
- **B** They would move to forests with young trees.
- **C** Their diets would change to available plants.
- **D** Their population would decrease further.

Performance Indicator: 3210.5.4 Describe the relationship between the amount of biodiversity and the ability of a population to adapt to a changing environment.

14.

The plant species *Juniperus excelsa* shows high genetic diversity. Studies of its genes suggest that some of this diversity results from geographically separate populations of the plant growing in different environments. Adaptation to local conditions has provided the species overall with which property?

- **A** strong ability to survive environmental change
- **B** wide range of usable energy resources
- **C** low vulnerability to animal predation
- **D** large variety of ecological roles

Go On ▶

Performance Indicator: 3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.

15. The table shows a comparison of the amino acid sequence in the p53 protein from seven species. The right column describes the percentages of amino acids within the sequence that are identical to the human sequence.

| Organism	Short Amino Acid Sequence Within the p53 Protein	Percentage of Amino Acid Sequence Similarity With Human p53
Human	Ser Gln Lys Thr Tyr Gln Gly Ser Tyr Gly Phe Arg Leu Gly Phe Leu His Ser	100
Rhesus Monkey	Ser Gln Lys Thr Tyr **His** Gly Ser Tyr Gly Phe Arg Leu Gly Phe Leu His Ser	95
Rabbit	Ser Gln Lys Thr Tyr **His** Gly **Asn** Tyr Gly Phe Arg Leu Gly Phe Leu His Ser	86
Dog	Ser **Pro** Lys Thr Tyr **Pro** Gly **Thr** Tyr Gly Phe Arg Leu Gly Phe Leu His Ser	80
Chicken	Ser **Thr Glu Asp** Tyr **Gly** Gly **Asp Phe Asp** Phe Arg **Val** Gly Phe **Val Glu Ala**	53
Channel Catfish	**Val Thr Ser Asp** Tyr **Pro** Gly **Leu Leu Asn** Phe **Thr** Leu **His** Phe **Gln Glu** Ser	48
Congo Puffer Fish	**Val Thr Thr Asp** Tyr **Pro** Gly **Glu** Tyr Gly Phe **Lys** Leu **Arg** Phe **Gln Lys** Ser	41

How does the sequence of the amino acids show relatedness between organisms?

○ **A** A rabbit and a Rhesus monkey are more closely related than a dog and a chicken.

○ **B** The fish are more closely related to a human than they are to a chicken.

○ **C** A dog and a fish are more closely related than a dog is to a chicken.

○ **D** A chicken is more closely related to mammals than to a fish.

Performance Indicator: 3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.

16. The cladogram shows how some vertebrates are classified.
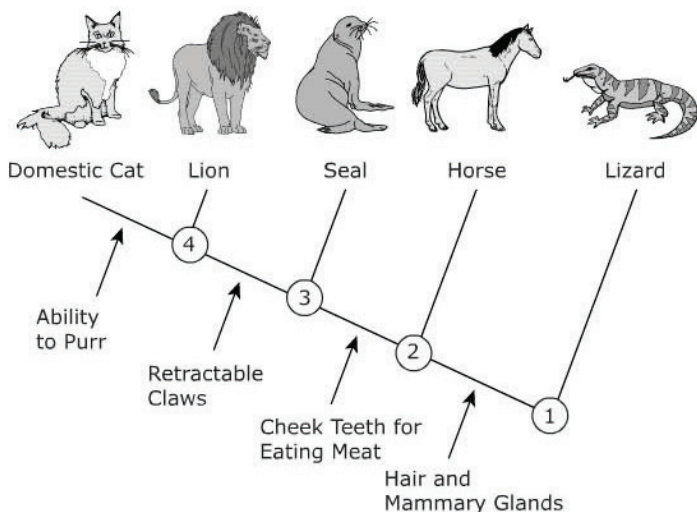

Which characteristic do domestic cats and lions share that separates them from the other animals?

○ **A** Hair and Mammary Glands

○ **B** Cheek Teeth for Eating Meat

○ **C** Retractable Claws

○ **D** Ability to Purr

Go On ▶

Performance Indicator: 3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.

17.

A simplified evolutionary path of the whale is shown.

Ancestral
Land Animal
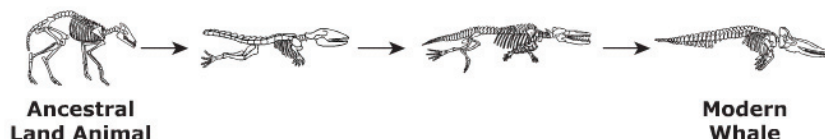
Modern
Whale

What is the **best** evidence to support the relationship of the modern whale to the immediate ancestor in the evolutionary path?

- **A** the presence of a tail in the ancestral whale
- **B** the observation that both animals have teeth
- **C** the observation that both animals live in the water
- **D** the presence of rudimentary hip bones in the whale

Performance Indicator: 3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.

18. Cytochrome c is a molecule found in the mitochondria of aerobic eukaryotic organisms. The amino acid sequence of cytochrome c has been mapped in humans and many animals. The number of different amino acids in the sequence in humans and certain animals is shown in the table.

Organisms	Cytochrome c Amino Acid Sequence Comparison
Human	0
Rhesus Monkey	1
Kangaroo	10
Turtle	15
Bull Frog	18

Which organism shares the **least** common ancestry with humans in the cytochrome c molecule?

- **A** Turtle
- **B** Kangaroo
- **C** Bull Frog
- **D** Rhesus Monkey

Go On ▶

Performance Indicator: 3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.

19.

Orcinus citoniensis is an extinct species of whale. Scientists have found records of its teeth and bones preserved in Pleiocene rocks. It had a smaller body size and greater number of teeth than its closest modern relative, *Orcinus orca*, the orca whale. What characteristic was <u>most</u> likely used to classify *Orcinus citoniensis* and *Orcinus orca* in the same genus?

- ○ **A** similar diet as shown by tooth comparisons
- ○ **B** similar habitat as shown by geographic location
- ○ **C** similar amino acids as shown by laboratory tests
- ○ **D** similar physical structure as shown by fossil evidence

Performance Indicator: 3210.5.6 Infer relatedness among different organisms using modern classification systems.

20.

Several plants and their scientific names are listed in the table.

Plant Names

| Plant	Genus Name	Species Name
Garlic	*Allium*	*moly*
Red Oak	*Quercus*	*rubra*
Sweetbay	*Magnolia*	*virginiana*
Ramps	*Allium*	*tricoccum*
Mulberry	*Morus*	*rubra*
Sweet Gum	*Liquidambar*	*styraciflua*

Which plants are <u>most</u> closely related?

- ○ **A** Garlic and Ramps
- ○ **B** Red Oak and Mulberry
- ○ **C** Sweet Gum and Red Oak
- ○ **D** Sweetbay and Sweet Gum

Go On ▶

Performance Indicator: 3210.5.6 Infer relatedness among different organisms using modern classification systems.

21. The diagram shows a phylogenetic tree for bacterial and archeal organisms.
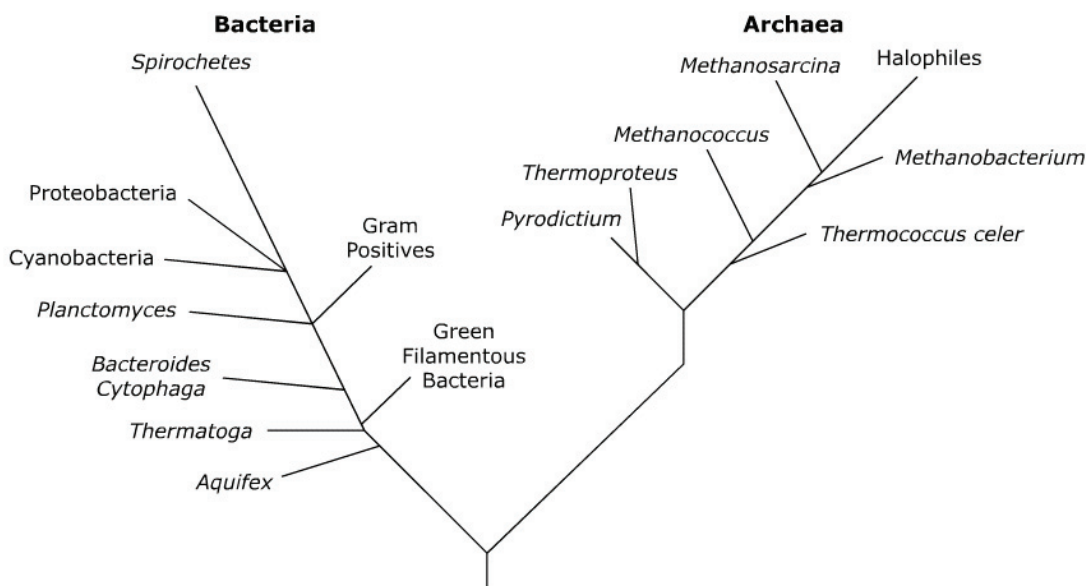
What can be inferred from the phylogenetic tree?

A Proteobacteria and Spirochetes are closely related.

B Cyanobacteria and Gram-Positive bacteria evolved at the same time.

C *Planctomyces* and *Methanococcus* lack a common ancestor.

D *Thermatoga* and *Thermoproteus* are older species than *Aquifex*.

Performance Indicator: 3210.5.6 Infer relatedness among different organisms using modern classification systems.

22. The table shows the classification of five different animals.

	Beaver	Fox	Otter	Rabbit	Shrew
Kingdom	Animalia	Animalia	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Chordata	Chordata	Chordata
Class	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia
Order	Rodentia	Carnivora	Carnivora	Lagomorpha	Soricomorpha
Family	Castoridae	Canidae	Mustelidae	Leporidae	Soricidae

Which organism is <u>most</u> closely related to the fox?

A beaver

B otter

C rabbit

D shrew

Go On ▶

Performance Indicator: 3210.5.1 Compare and contrast the structural, functional, and behavioral adaptations of animals or plants found in different environments.

23.

The Western gray squirrel, *Sciurus griseus*, lives in forests along the Pacific Coast. The Eastern gray squirrel, *Sciurus carolinensus*, lives in forests of the Eastern United States. The table summarizes some facts about both species.

Characteristics	Eastern Gray Squirrel (*Sciurus carolinensus*)	Western Gray Squirrel (*Sciurus griseus*)
Adult Weight (kg)	0.533	0.425
Female Maturity (days)	343	319
Gestation Period (days)	44	44
Weaning Time (days)	66	61
Litter Size	4	3
Litters per Year	2	1

Which characteristic indicates that Western gray squirrels have access to a more nutritious food supply?

○ **A** Adult Weight

○ **B** Gestation Period

○ **C** Weaning Time

○ **D** Litters per Year

Performance Indicator: 3210.5.1 Compare and contrast the structural, functional, and behavioral adaptations of animals or plants found in different environments.

24.

Animals display certain behaviors to communicate in their environments. Some male deer rub a scent on trees. Some dogs bark at people walking by. How are these behaviors displayed by male deer and dogs similar?

○ **A** Both communicate territorial boundaries.

○ **B** Both warn about nearby danger.

○ **C** Both signal location of food.

○ **D** Both discourage predators.

Performance Indicator: 3210.5.1 Compare and contrast the structural, functional, and behavioral adaptations of animals or plants found in different environments.

25.

Both porcupines and cacti have spines projecting from their bodies.

Porcupine   Cactus

What function do spines provide these organisms?

○ **A** reduce water loss

○ **B** increase cooling

○ **C** enable predation

○ **D** provide defense

Performance Indicator: 3210.5.1 Compare and contrast the structural, functional, and behavioral adaptations of animals or plants found in different environments.

26.

Rain forest trees and desert cacti have adaptations that enable their survival in these ecosystems. Which adaptation is characteristic of many rain forest trees?

○ **A** small leaves

○ **B** thorny stems

○ **C** a deep root system

○ **D** a shallow root system

Go On ▶

Performance Indicator: 3210.5.2 Recognize the relationship between form and function in living things.

27.

Hummingbirds are found in forested areas, meadows, and grasslands. Hummingbirds have a unique body plan, well suited to surviving in almost any environment as long as there are flowers, insects, and other hummingbirds. A picture of a hummingbird is shown.


How does the structure of the bill **most** likely function in survival of the hummingbird?

  ○ **A** It uses the bill to balance while hovering.

  ○ **B** It uses the bill to peck holes in trees to find insects.

  ○ **C** It uses the bill to attract other hummingbirds for mating.

  ○ **D** It uses the bill to drink nectar from tube-shaped flowers.

Performance Indicator: 3210.5.2 Recognize the relationship between form and function in living things.

28.

The fennec fox has large ears, thick sandy-colored fur, and lives in a desert environment.
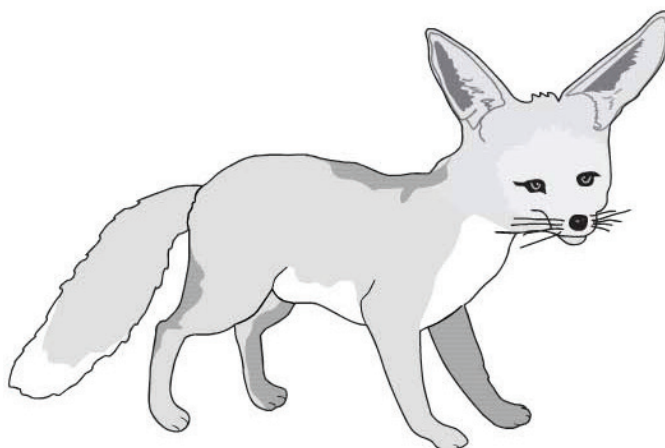
What purpose does having large ears and sandy-colored fur provide for the fox's survival in the desert?

  ○ **A** Both provide camouflage.   ○ **C** Both reduce loss of energy.

  ○ **B** Both decrease water loss.   ○ **D** Both aid in regulating body temperature.

Go On ▶

Performance Indicator: 3210.5.2 Recognize the relationship between form and function in living things.

29. Ants have many body parts that each serve a special purpose. The location of each body part helps the ant function in its environment. Why are the antennae of the ant located on the head?
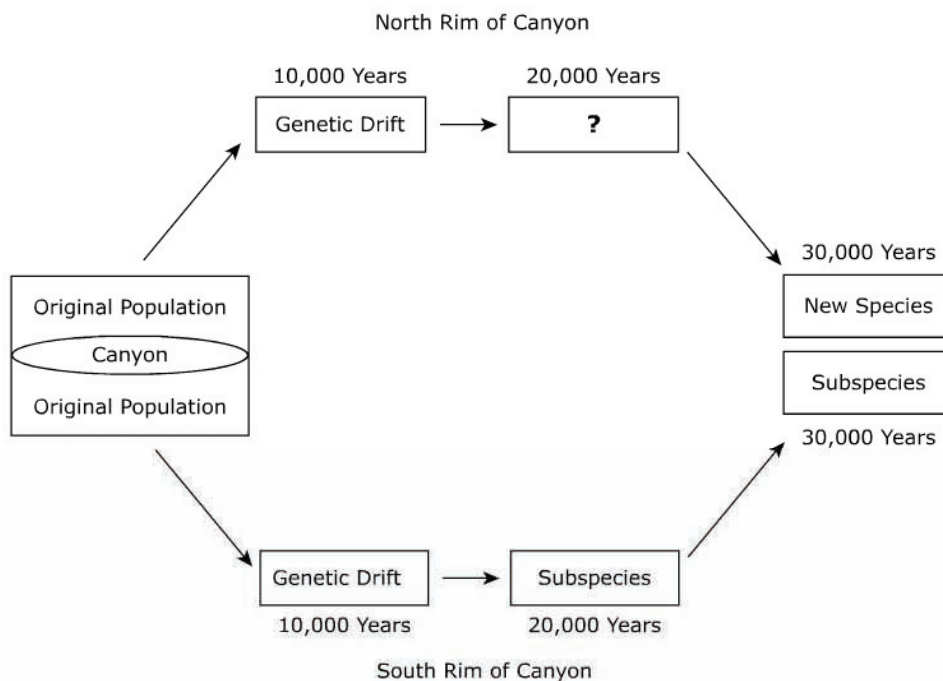
   ○ **A** They are used for chewing.

   ○ **B** They are used for defense.

   ○ **C** They are used for sensing.

   ○ **D** They are used for movement.

Performance Indicator: 3210.5.3 Recognize the relationships among environmental change, genetic variation, natural selection, and the emergence of a new species.

30. When a geographic barrier, such as the appearance of a canyon due to a large earthquake, splits a population, changes occur affecting the isolated members of the population. Over a long period of time, these changes may lead to speciation. The diagram illustrates this process.

Example of Speciation

North Rim of Canyon

10,000 Years	20,000 Years
Genetic Drift	?

30,000 Years

New Species

Subspecies

30,000 Years

Original Population
Canyon
Original Population

10,000 Years	20,000 Years
Genetic Drift	Subspecies

South Rim of Canyon

What **most** likely happened to the population on the north rim of the canyon after 20,000 years?

   ○ **A** Immigration of similar species occurred.

   ○ **B** Cross breeding with other species occurred.

   ○ **C** Natural selection selected new traits in the population.

   ○ **D** Recessive mutations caused the population to become extinct.

Performance Indicator: 3210.5.3 Recognize the relationships among environmental change, genetic variation, natural selection, and the emergence of a new species.

31. **A population of oak trees is severely reduced by a fungal disease. Some trees are resistant to the disease and survive. The surviving trees produce acorns with the more advantageous trait. The survival and reproduction of these oak trees is an example of which mechanism of change?**

   ○ **A** mutation

   ○ **B** speciation

   ○ **C** natural selection

   ○ **D** artificial selection

Performance Indicator: 3210.5.3 Recognize the relationships among environmental change, genetic variation, natural selection, and the emergence of a new species.

32. **Asian shore crabs were introduced to the Atlantic coast of the United States and have been migrating north. This invasive species competes with the native green crab. These two crabs prey on the blue mussel. In the presence of predator crabs, the blue mussel produces a thicker shell. Scientists studied how the presence of the two crab species impacted the shell development of the blue mussel. Blue mussels from two different parts of the Atlantic coast (north and south) were exposed to either Asian shore crabs or green crabs and shell thickness was measured. The observations of the study are shown.**

Crab	Southern Blue Mussels	Northern Blue Mussels
Green	Shells thicken	Shells thicken
Asian Shore	Shells thicken	Shells do not thicken

Which explanation best describes the observations from the experiment?

   ○ **A** The northern blue mussels have been unable to respond to green crabs.

   ○ **B** The green crabs are unable to respond to changes in the blue mussels with thicker shells.

   ○ **C** The Asian shore crabs have evolved a mechanism to prey on blue mussels with thicker shells.

   ○ **D** The southern blue mussels have developed a defense mechanism to respond to the Asian shore crabs.

Performance Indicator: 3210.5.3 Recognize the relationships among environmental change, genetic variation, natural selection, and the emergence of a new species.

33. **Galapagos finches live in many of the same areas on the Galapagos Islands but have different physical appearances. What is the _best_ explanation for this observation?**

   A   a lack of environmental change

   B   genetic variation in ancestors

   C   random changes in the animals over time

   D   migration of animals into the environment

Performance Indicator: 3210.5.4 Describe the relationship between the amount of biodiversity and the ability of a population to adapt to a changing environment.

34. **A population of mammal species is subjected to an extremely cold winter. A portion of the population does not survive the harsh conditions. Researchers identify a characteristic in the surviving species that enables them to store more fat than those that did not survive. How will this change in population distribution affect the future species population?**

   A   The population could continue to decrease because of a weakened gene pool.

   B   The population will reproduce more offspring that have this insulating characteristic.

   C   The population could continue to decrease if they experience extreme temperatures.

   D   The population will begin to compete for resources to increase insulation for upcoming winters.

Go On ▶

Performance Indicator: 3210.5.4 Describe the relationship between the amount of biodiversity and the ability of a population to adapt to a changing environment.

35. The Canadian province of Saskatchewan is located at high latitude, has no mountains or coasts, and receives little rainfall. Scientists have concluded that organisms in Saskatchewan have a low ability to survive changes in their environmental conditions. The latitude, topography, and rainfall of Saskatchewan have resulted in which property among organisms in Saskatchewan?

   A high migration rate

   B low energy demand

   C high mutation rate

   D low biodiversity

Performance Indicator: 3210.5.4 Describe the relationship between the amount of biodiversity and the ability of a population to adapt to a changing environment.

36. During the spring a species of plant produces flowers over a course of many weeks. What is the most likely reason this species of plant produces flowers over a duration of time?

   A This increases the chance of survival against invasive plant species.

   B This decreases the chance of competition between the plant species for sunlight.

   C This increases the chances of pollination during changing environmental conditions.

   D This decreases the chance of pollination with plants of the same species with different genetic characteristics.

Performance Indicator: 3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.

37. Scientists use DNA sequencing to identify the relatedness of species. The number and location of functional DNA sequences indicate the degree to which the organisms are related. The diagram illustrates sequencing of homologous parts of the genomes of several mammals.

| Cow: | 5' – A T A G T A G A T C G C G C A T – 3' |
Dog:	5' – A G C G T A C T T G C C G T A G – 3'
Hedgehog:	5' – A G C G T A G T T A C C G T A C – 3'
Horse:	5' – A C C G T A T T T G C C G A A G – 3'
Mouse:	5' – A G C G T A G T T T C C G T A C – 3'

Based on the arrangement of symbols, which two mammals are classified as <u>least</u> closely related?

- A Hedgehog and Horse
- B Dog and Horse
- C Mouse and Cow
- D Mouse and Dog

Performance Indicator: 3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.

38. Biologists have classified a variety of extinct species as being related to ancestors of the horse. The lower leg structures of several of the species related to the horse are illustrated in the diagram.

4 Million Years Ago

55 Million Years Ago
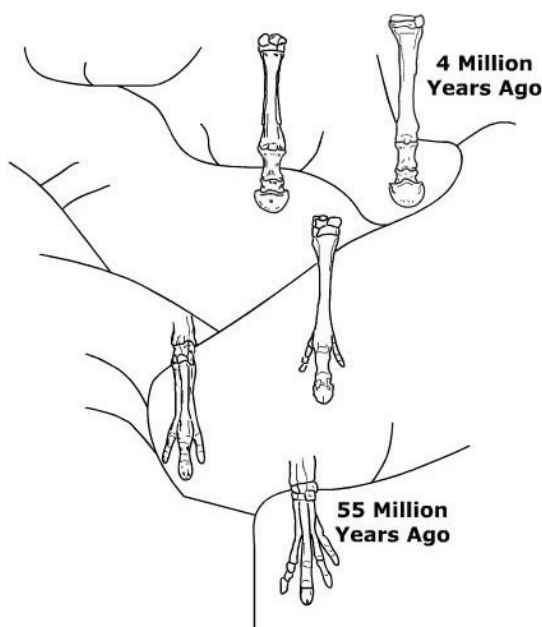
What information do the differences in the leg structures provide in the development of the phylogenetic tree?

- A They demonstrate that the horse is better adapted than species classified as its ancestors.
- B They represent fossil evidence supporting the proposed classifications of species.
- C They represent hypothetical limb structures based on sequencing of fossil DNA.
- D They demonstrate that adaptations become simpler over time.

Go On ▶

Performance Indicator: 3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.

39. The figure below shows alligator and mouse embryos sharing the similarity of limb bud development.

Limb Buds

**Mouse
Embryo
Development**

Limb Buds

**Alligator
Embryo
Development**
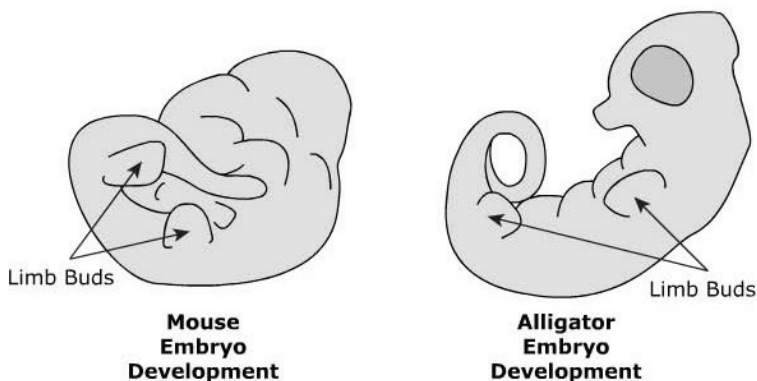
What evidence is supported by the alligator and mouse embryos sharing similarities during development?

- A These organisms have a related ancestor.

- B Development of organisms is unique to each species.

- C Development is unrelated to the physical features of an organism.

- D The female parent determines the physical features of the offspring.

Performance Indicator: 3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.

40. The table shows the number of similar amino acid residues in the beta chain of hemoglobin of different species as compared to human beta chain hemoglobin amino acids.

Species	Number of Differing Amino Acids
Human	0
Dog	15
Mouse	27
Chicken	45
Frog	67

Which of these classification relationships is **best** supported by this information?

- A Frogs are more closely related to humans than humans are to mice.

- B Chickens are more closely related to humans than dogs are to mice.

- C Mice are more closely related to humans than mice are to chickens.

- D Dogs are more closely related to humans than dogs are to chickens.

Performance Indicator: 3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.

41.

The table shows the relative percentage of genetic similarity of different species with humans.

Species	Percentage of Genes that are Similar to Humans
Chimpanzee	98
Fruit Fly	44
Mouse	92
Thale Crest	18
Yeast	26

Based on these data, which species is <u>least</u> closely related to the humans?

○ **A** Fruit Fly

○ **B** Mouse

○ **C** Thale Crest

○ **D** Yeast

Performance Indicator: 3210.5.6 Infer relatedness among different organisms using modern classification systems.

42.

The table shows the classification of several animals. All of the animals are in phylum Arthropoda.

	Animal 1	Animal 2	Animal 3	Animal 4	Animal 5
Class	Malacostraca	Diplopoda	Malacostraca	Diplopoda	Malacostraca
Order	Decapoda	Callipodia	Decapoda	Callipodia	Cumacea
Family	Hippadae	Abacionidae	Astacidae	Abacionidae	Leuconidae
Genus	*Hippa*	*Tetracion*	*Astacus*	*Abacion*	*Leucon*
Species	*testodaria*	*jonesi*	*astacus*	*magnum*	*fulvus*

Which two arthropods are <u>most</u> closely related?

○ **A** Animal 1 and Animal 3

○ **B** Animal 1 and Animal 5

○ **C** Animal 2 and Animal 4

○ **D** Animal 2 and Animal 3

Go On ▶

Performance Indicator: 3210.5.6 Infer relatedness among different organisms using modern classification systems.

43. **The table shows the classification of six different plants.**

	Plant 1	Plant 2	Plant 3	Plant 4	Plant 5	Plant 6
Kingdom	Plantae	Plantae	Plantae	Plantae	Plantae	Plantae
Phylum	Magnoliophyta	Magnoliophyta	Magnoliophyta	Magnoliophyta	Magnoliophyta	Magnoliophyta
Class	Magnoliopsida	Magnoliopsida	Magnoliopsida	Magnoliopsida	Magnoliopsida	Lipiopsida
Order	Ericales	Ericales	Ericales	Ericales	Ericales	Arecales
Family	Theaceae	Sapotaceae	Sapotaceae	Sapotaceae	Sapotaceae	Arecaceae
Genus	*Carnelia*	*Chrysophyllum*	*Pouteria*	*Manilkara*	*Chrysophyllum*	*Brahea*
Species	*japonica*	*cainito*	*gardneri*	*dardanoi*	*albidum*	*dilcis*

Which two plants are <u>most</u> closely related?

○ **A** Plant 1 and Plant 6

○ **B** Plant 2 and Plant 5

○ **C** Plant 3 and Plant 4

○ **D** Plant 1 and Plant 4

Performance Indicator: 3210.5.6 Infer relatedness among different organisms using modern classification systems.

44. **Scientists use DNA sequences to establish evolutionary relationships. The table shows the DNA sequences from six organisms. The sequences are from the same region in each organism's DNA.**

Organism	DNA Sequence
1	GTA AGC ACC GTT GTA
2	GTA ACC GCC TTT GAA
3	GTA AGC GCC ATT GTA
4	GTA AGC TCC GTT GTA
5	GTA ATA CGC GAT GCA
6	GTA AGC GCC CTT GTA

Which two organisms have a DNA sequence that is <u>most</u> closely related?

○ **A** Organism 2 and Organism 6

○ **B** Organism 3 and Organism 5

○ **C** Organism 1 and Organism 4

○ **D** Organism 1 and Organism 5

Reporting Category 6: Biodiversity and Change		
Item Number	**Correct Answer**	**Performance Indicator**
1	A	3210.5.1 Compare and contrast the structural, functional, and behavioral adaptations of animals or plants found in different environments.
2	A	3210.5.1 Compare and contrast the structural, functional, and behavioral adaptations of animals or plants found in different environments.
3	D	3210.5.1 Compare and contrast the structural, functional, and behavioral adaptations of animals or plants found in different environments.
4	A	3210.5.1 Compare and contrast the structural, functional, and behavioral adaptations of animals or plants found in different environments.
5	B	3210.5.1 Compare and contrast the structural, functional, and behavioral adaptations of animals or plants found in different environments.
6	A	3210.5.2 Recognize the relationship between form and function in living things.
7	D	3210.5.2 Recognize the relationship between form and function in living things.
8	A	3210.5.3 Recognize the relationships among environmental change, genetic variation, natural selection, and the emergence of a new species.
9	A	3210.5.3 Recognize the relationships among environmental change, genetic variation, natural selection, and the emergence of a new species.
10	C	3210.5.3 Recognize the relationships among environmental change, genetic variation, natural selection, and the emergence of a new species.
11	B	3210.5.3 Recognize the relationships among environmental change, genetic variation, natural selection, and the emergence of a new species.
12	B	3210.5.4 Describe the relationship between the amount of biodiversity and the ability of a population to adapt to a changing environment.
13	D	3210.5.4 Describe the relationship between the amount of biodiversity and the ability of a population to adapt to a changing environment.

14	A	3210.5.4 Describe the relationship between the amount of biodiversity and the ability of a population to adapt to a changing environment.
15	A	3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.
16	C	3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.
17	D	3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.
18	C	3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.
19	D	3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.
20	A	3210.5.6 Infer relatedness among different organisms using modern classification systems.
21	A	3210.5.6 Infer relatedness among different organisms using modern classification systems.
22	B	3210.5.6 Infer relatedness among different organisms using modern classification systems.
23	C	3210.5.1 Compare and contrast the structural, functional, and behavioral adaptations of animals or plants found in different environments.
24	A	3210.5.1 Compare and contrast the structural, functional, and behavioral adaptations of animals or plants found in different environments.
25	D	3210.5.1 Compare and contrast the structural, functional, and behavioral adaptations of animals or plants found in different environments.
26	D	3210.5.1 Compare and contrast the structural, functional, and behavioral adaptations of animals or plants found in different environments.
27	D	3210.5.2 Recognize the relationship between form and function in living things.

28	D	3210.5.2 Recognize the relationship between form and function in living things.
29	C	3210.5.2 Recognize the relationship between form and function in living things.
30	C	3210.5.3 Recognize the relationships among environmental change, genetic variation, natural selection, and the emergence of a new species.
31	C	3210.5.3 Recognize the relationships among environmental change, genetic variation, natural selection, and the emergence of a new species.
32	D	3210.5.3 Recognize the relationships among environmental change, genetic variation, natural selection, and the emergence of a new species.
33	B	3210.5.3 Recognize the relationships among environmental change, genetic variation, natural selection, and the emergence of a new species.
34	B	3210.5.4 Describe the relationship between the amount of biodiversity and the ability of a population to adapt to a changing environment.
35	D	3210.5.4 Describe the relationship between the amount of biodiversity and the ability of a population to adapt to a changing environment.
36	C	3210.5.4 Describe the relationship between the amount of biodiversity and the ability of a population to adapt to a changing environment.
37	C	3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.
38	B	3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.
39	A	3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.
40	D	3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.
41	C	3210.5.5 Apply evidence from the fossil record, comparative anatomy, amino acid sequences, and DNA structure that support modern classification systems.

42	C	3210.5.6 Infer relatedness among different organisms using modern classification systems.
43	B	3210.5.6 Infer relatedness among different organisms using modern classification systems.
44	C	3210.5.6 Infer relatedness among different organisms using modern classification systems.